# CONSTRUCTION SPECIFICATION

# 642. WATER WELL

## 1. SCOPE

The work shall consist of furnishing materials and installing all components of the water well as outlined in this specification and the drawings.

## 2. MATERIALS

**Casings:** Casings shall be of steel, iron, stainless steel, copper alloys, plastic, fiberglass, or concrete of sufficient strength and durability consistent with the intended use of the water and the maximum anticipated differential head between the inside and outside of the casing. Steel and plastic casing materials shall meet the strength requirements stated in Section 5 of this specification or in the drawings. Other casing materials shall be certified by the manufacturer or a registered Professional Engineer as being of adequate strength.

Steel well casings shall meet or exceed requirements specified in ASTM A 589. Steel pipe manufactured for other purposes may be used if the quality of the pipe meets or exceeds requirements specified in ASTM A 589.

Plastic casings made of acrylonitrile-butadiene-styrene (ABS), polyvinyl chloride (PVC), or styrene-rubber (SR) shall conform to material, dimensional and quality requirements specified in ASTM F 480.

If the water is to be used for human consumption, plastic pipe shall be approved by the National Sanitation Foundation.

Plastic pipe manufactured for water or irrigation pipelines may be used if the quality equals or exceeds requirements specified in ASTM F 480.

Filament-wound fiberglass casings (glass-fiber-reinforced-thermosetting-resin pipe, RTRP) may be used if material meets requirements specified in ASTM D 2996. Tests for long-term cyclic pressure strength, long-term static pressure strength, and short-term rupture strength as required in ASTM D 2996 are not needed because the pipe is to be used for well casing. Joints shall meet requirements specified in section 3.8, ASTM F 480.

Fiberglass pressure pipe, (also called reinforced plastic mortar pipe, RPMP, or fiberglass pipe with aggregate) shall meet or exceed requirements specified in ASTM D 35l7.

Concrete casing shall be reinforced and shall meet or exceed the requirements specified in ASTM C 76. The minimum 28-day compressive strength shall be 4,000 psi.

**Joints**: Well casing joints shall have adequate strength to carry the load due to the casing length and still be watertight, or shall be mechanically supported during installation to maintain joint integrity. Such mechanically supported casings shall terminate on firm material that can adequately support the casing weight.

**Screen**: Well screens shall be constructed of commercially manufactured screen sections, well points, or field-perforated sections. Perforation by any method is allowable provided proper slot size and entrance velocity limits can be met. The length and open area of the screen shall be sized to limit entrance velocity of water into the well to less than or equal to 0.1 foot per second.

**Gravel Pack:** If gravel pack is used, it shall have the gradation and thickness specified in the design.

**Annular Seal:** Expansive hydraulic cement (ASTM C 845), shrinkage-compensating concrete, or bentonite-based grout shall be used to seal the annulus between the casing and the outside of the drill hole. Other sealing material shall be approved by the Engineer before it is used.

## 3. EQUIPMENT

The installer shall provide and operate all equipment necessary to install the well in a safe

manner. The operator shall have a Water Well Driller's License and a Drilling Rig Permit, issued by the PA Geological Survey, for the equipment used on the site.

**4. INSTALLATION**

Drilled, jetted, bored, and driven wells shall be sufficiently round, straight, and of adequate diameter, to permit satisfactory installation of the inlet, well casing, filter pack, and annular seal, and passage of tremie pipe (including couplings), if used.

**Casing**: Casing shall extend from above the ground surface down through unstable earth materials to a depth of at least 2 feet into stable material or to the top of the screen.

All wells shall be cased to a sufficient height (minimum of 12 inches) above the ground surface to prevent entry of surface and near-surface water.

Only steel pipe casings shall be used in driven wells. To prevent galvanic corrosion, dissimilar metals shall not be joined.

**Screen**: Well screen shall be installed in any earth material likely to produce silt or sand.

Depth of the aquifer below ground surface and the thickness of aquifer to be penetrated by the well shall govern the position of the screen in the well.

Maximum drawdown shall not be permitted below the top of the highest screen or pump intake.

**Seals (Packers)**: Telescoped screen assemblies shall be provided with one or more sand-tight seals between the top of the telescoped screen assembly and casing.

**Gravel Pack:** Where a gravel pack is used in unconsolidated aquifers, it shall be carefully placed to prevent segregation and bridging. Gravel pack material shall extend a minimum of 10 feet above the top of the perforated or screened section and shall extend through the depth of the water bearing formation.

For heaving or caving sands, silty or fine-grained aquifers, and for horizontal or angled wells, a commercial prepacked well screen may be substituted for a conventionally installed (by tremie) gravel pack.

**Well Development**: Wells to be completed without a filter pack in unconsolidated granular aquifers shall be developed following guidance provided in ASTM D 5521, Standard Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers.

The method shall be selected based on geologic character of the aquifer, type of drilling rig, and type of screen.

**Aquifer Development**: For massive, unfractured rock formations unresponsive to well development procedures, the use of aquifer stimulation techniques may be used to improve well efficiency and capacity, if permitted in Section 5 of this specification. Techniques may include dry ice, acidizing, explosives, or hydrofracturing, depending on the composition and structure of the formation, and as specified in Section 5.

**Grouting and Sealing**: The annulus surrounding the permanent well casing at the upper terminus of the well shall be filled with approved annular sealing material. The depth of the annular seal shall be no less than 10 feet and not less than the minimum specified in applicable construction codes.

A positive seal (grouted in place) or packer shall be provided between the casing and the less pervious material overlying the aquifer of artesian wells in such a manner as to retain confining pressure.

If a zone is penetrated that is determined or suspected to contain water of quality unsuitable for the intended use, the zone shall be sealed to prevent infiltration of the poor-quality water into the well and the developed portion of the aquifer.

**Well Cap:** The top of the casing shall be equipped with a vented cap or well seal to prevent rainfall or insects from entering the well.

**Access Port**: An access port with a minimum diameter of 0.5 inch shall be installed to allow for unobstructed measurement of depth of the water surface, or for a pressure gage for measuring shut-in pressure of a flowing well. Access ports and pressure gages or other openings in the cover shall be sealed or capped to prevent entrance of surface water or foreign material into the well. Removable caps are acceptable as access ports.

**Wellhead Protection:** Surface runoff and drainage that might reach the wellhead from areas used by livestock or other contaminant sources shall be diverted away from the well.

The ground surface around the well shall be graded away from the well for a distance of at least five feet in all directions. Low points where water can puddle on the surface shall be eliminated.

If the well water is intended for human consumption, the casing shall be surrounded at the ground surface by a 4-inch thick concrete slab extending at least 2 feet in all directions.

If the top of the well casing is subject to flooding from surface water, either of two methods shall be used to prevent floodwater from entering the well: (1) the well cap shall be water tight and equipped with a vent that extends two feet above the 100 year flood level, or (2) the well casing shall be extended to two feet above the 100 year flood level.

**Disinfection**: Wells shall be disinfected immediately following their construction or repair to neutralize any contamination from equipment, material, or surface drainage introduced during construction. The disinfection process shall comply with all local or state requirements.

**Water Quality Testing**: Sampling and testing shall comply with all applicable federal, state, and local requirements. These requirements vary according to the water quality parameters associated with the intended use(s) of the water.

**Documentation:** The well driller shall provide to the landowner and the PA Geological Survey copies of the water well completion report.

**5. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:**